

REMARKS

The Final Office Action mailed February 9, 2005, has been carefully reviewed and, by this Amendment, Applicants have canceled claim 12 and amended claims 1 and 11. Claims 1-11 are pending; claim 1 is independent.

The Examiner rejected claim 11 under 35 U.S.C. 112, second paragraph, as being indefinite. With the amendments set forth herein, claim 11 is in conformity with the requirements of 35 U.S.C. 112, second paragraph, and withdrawal of the rejection is requested.

The Examiner maintained her rejection of claims 1-4 and 6 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,763,315 to Benedict et al. (“Benedict”). The Examiner also maintained her rejection of claims 5 and 7-11 under 35 U.S.C. 103(a) as being unpatentable over Benedict in view of U.S. Patent No. 6,255,194 to Hong.

As set forth in amended claim 1, the present invention is directed to a method for forming a device isolation film that begins by sequentially forming a pad oxide film and a pad nitride film on the semiconductor substrate. Following etching to form a trench, and the formation of a thermal oxide film 116 on the surface of the trench, an annealing process is performed on the thermal oxide film 116 using NH₃ atmosphere to make an oxide nitride film 120. Thereafter, a liner nitride film 118 is formed on the oxide nitride film 120 and the pad nitride film 114 to improve interface characteristic between the thermal oxide film 116 and the liner nitride film 118, thereby decreasing the leakage current generated due to the liner nitride film 118 without affecting the refresh characteristics of the device.

As shown in Figure 3f of the present application and set forth in claim 1, the oxide nitride film 120 is formed between the thermal oxide film 116 and the liner nitride film 118 by an annealing process using NH₃ on the thermal oxide film 116. As also now claimed, the liner nitride film 118 is formed on the oxide nitride film 120 and the pad nitride film (as shown in Figure 3e) to improve the interface characteristic between the thermal oxide film 116 and the liner nitride film 118. This is not shown or suggested by Benedict.

Benedict teaches a single oxynitride layer 20 (Figure 1F of Benedict) or a dual oxynitride film 44/silicon nitride layer 42 liner (Figure 2E of Benedict) formed on a thermal oxide layer 18. The liners are only improved liners to function as a barrier against oxygen diffusion and to be resistant to hot phosphoric and hydrofluoric acids. There is no teaching or suggestion of any improved interface characteristic between the thermal oxide layer 18 and the silicon nitride layer 42 in Benedict.

The single oxynitride layer 20 or the dual oxynitride film 44/silicon nitride layer 42 liner formed on the thermal oxide layer 18 of Benedict is entirely different from the oxide nitride film 120 formed between the thermal oxide film 116 and the liner nitride film 118 of the present application, and the structures of Benedict cannot achieve the effects of the present invention, namely to improve the characteristic of the interface between the thermal oxide film and the liner nitride film.

For at least the foregoing reasons, claim 1 is patentable over Benedict. Favorable reconsideration and allowance thereof is requested.

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Claims 2-11 are also in condition for allowance as claims properly dependent on an allowable base claim and for the subject matter contained therein.

Applicants present this Amendment as being proper after Final action in that the Examiner has already considered the issues addressed herein such that no new issues requiring further consideration and/or search are presented hereby. The Examiner explicitly stated that the improved interface characteristic as well as the forming of the liner nitride film on the oxide nitride film were clear issues raised by the Applicants which were not claimed prior to this Amendment but which, to Applicants understanding, with the claiming thereof place the application into condition for allowance. Entry of the foregoing Amendment and allowance of the application are therefore requested.

Should the Examiner have any questions or comments, the Examiner is cordially invited to telephone the undersigned attorney so that the present application can receive an early Notice of Allowance.

Respectfully submitted,

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